DFI EUROPE MEMBER: FUGRO

Full-scale Static Bi-directional O-cell Foundation Testing to Optimise Foundation Design Safely and Sustainably

Worldwide awareness of climate change continues to increase, as do calls for action. Reducing our carbon footprint is a priority if we hope to minimize the impact of global warming. Concrete production is responsible for 5-7 percent of total CO2 emissions worldwide. The construction industry, and in particular the foundation industry, can take steps to reduce their contribution.

Accurate foundation design is a critical area for efficient use of concrete and steel in the ground. Calibration of the design of foundations can unlock huge savings in terms of material usage and project timescales and these are best done by full-scale load testing to evaluate the pile or barrette behaviour.

Bi-Directional Pile Load Testing

Full-scale static load testing can be performed by either applying the full test load at the head of the foundation in the traditional manner, with kentledge or a reaction beam and anchor piles, or performed bi-directionally by casting the loading element within the foundation itself. O-cell bi-directional load testing can be used to verify the pile performance and compare it against the design in the most efficient, safe and cost-effective manner of all types of foundations, particularly for larger test loads.

Geneva Case Study

In Geneva, we were involved at a project for the extension of a factory. A traditional, nominally cylindrical pile design would be the foundation for the toe of the piles in the moraine, but instead an alternative pile installation technique using a ream was considered and the behaviour of two test piles verified with O-cell tests. The reamed design piles have a significantly smaller diameter and significantly reduce the volume of the piles and therefore the material extracted, concrete used, transport requirements, etc. The alternative pile design reduced more than 400 tonnes (440 T) of CO2 emissions. Also, the use of electric concrete trucks at another project in Geneva reduced the of CO2 emissions as well.

Handling a reinforcement cage with built-in O-cells

High-Speed Rail Across Europe

Fugro is also involved in numerous sections of High Speed 2 (HS2), the U.K.'s new high-speed rail network, including foundation testing programs. HS2 will integrate new railway lines and upgrades across Britain's rail system to deliver faster travel to many towns and cities not directly on the HS2 route, including Liverpool, Sheffield, Leeds, Nottingham and Derby. HS2 trains will be powered by zero carbon energy for a cleaner, greener future. A recent project was the foundation test program at Birmingham Curzon Street Station. Two key benefits of this full-scale pile testing program are the savings on materials due to shorter pile lengths and increased design confidence. We are involved with the construction of high-speed rail lines in other countries, including Italy, which is pursing rail as a clean and green solution to transportation, one of the largest sources of carbon emissions. Fugro has been involved with bi-directional load testing to support this green goal.

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Electric trucks in Geneva